

Chainsaw operation

Maintenance, Crosscutting and Pruning

4th Edition

Aligned to the national
FWP and AHC chainsaw
and pole saw units –
current in January 2024



Chainsaw operation

Maintenance, Crosscutting and Pruning

4th Edition

The material in this booklet is aligned to the following units of competency from the FWP and AHC Training Packages. For a summary of the assessment requirements, see *Chapter 10: Competency assessments*.

- **AHCMOM213: Operate and maintain chainsaws**
- **FWPCOT2259: Cut materials with a hand-held chainsaw**
- **FWPCOT2254: Maintain chainsaws**
- **FWPCOT2273: Trim and cut felled trees**
and FWPCOT2256: Trim and cut felled trees *
- **FWPCOT3301: Trim trees using a pole saw**

** superseded in 2023 but still current in some qualifications*

ISBN: 978-1-925087-55-0

Copyright

© 2024 McElvenny Ware Pty Ltd trading as Workspace Training.

No part of this publication may be reproduced or stored by any means without the written permission of McElvenny Ware Pty Ltd other than for private study or research, as permitted under the Copyright Act.

All on-site photos were taken by David McElvenny and the other members of the technical advisory committee (listed on the next page). Studio images of name-branded products were supplied by the product manufacturers.

All line drawings were produced by Kath Ware. Most of the drawings are based on graphics provided by Husqvarna for the related interactive e-learning resource: *Chainsaw operation – Beginner to advanced*.

Source material

This booklet is based on material contained in the interactive e-learning resource developed by Workspace Training called *Chainsaw operation – Beginner to advanced*. The original resource was developed 2009 with funding provided by the Commonwealth Government's Workplace English Language and Literacy (WELL) Program.

The technical information is drawn from publications made available by Husqvarna and Stihl for the above WELL project, as well as the original NSW State Forests publication *Chainsaw Operators Manual* (2001).

The e-learning resource continues to be revised as changes occur in the FWP and AHC Training Packages, and is available for purchase. For more information, or to order the resource, please go to: www.workspacetraining.com.au and follow the links.

Technical Advisory Committee

The following chainsaw experts were involved in the development and review of this booklet:

Ben Sparks – Training Manager, Power Safety Training (PST)

Ray Stone – Principal, Chainsaw Accreditation and Safety Training

Goetz Graf – Director, Tree Management Australia

All three experts were members of the original technical advisory committee involved in the development of the interactive e-learning resource.

Disclaimer

Chainsaw use is an inherently dangerous activity. This booklet is designed to provide background information for participants undertaking a face-to-face course in chainsaw operation with a qualified trainer.

It is not designed to be used as a substitute for face-to-face training.

While all care has been taken in the preparation of this resource, McElvenny Ware Pty Ltd (trading as Workspace Training) and all individuals involved in its development do not accept any liability to any person for the information or advice provided in this booklet, the use of such information or advice, or any errors or omissions.

No liability is accepted for any damage or loss, including indirect and consequential loss, incurred by any person as a result of relying on the information or advice contained in this booklet.

The information is provided on the basis that all persons undertake full responsibility for assessing the relevance and accuracy of its content.

In all cases, chainsaw operators, trainers and other parties using this resource should follow the directions provided by the manufacturer of their equipment, and seek further advice from the manufacturer and/or their employer if they believe there are any discrepancies between the different sources of information.

Improvements and updates

We welcome all feedback from users of the *Chainsaw Operation* booklets. If you have any suggestions for improvements or have noticed errors that need correcting, please contact David McElvenny at: david@workspacetraining.com.au.

Contents

1. Introduction	1
2. Safety and environmental care.....	2
Safety features on a chainsaw	2
Personal Protective Equipment.....	5
Other items of equipment.....	6
Legislation and regulations	7
Environmental care procedures	9
Fire prevention.....	12
Risk assessment.....	14
3. Using a chainsaw	15
Types of chainsaws	15
Fueling up.....	17
Tensioning the chain.....	18
Starting a chainsaw.....	19
Kickback	21
4. Maintaining a petrol chainsaw.....	22
Powerhead	22
Drive sprockets	24
Guide bar.....	25
Chains	26
Chain sharpening.....	29
5. Cutting materials	33
Preparing the area	33
Cutting packs of timber	34

6. Trimming & cutting felled trees.....	36
The 3 basic cuts	36
The 2 main stresses	38
Bridging cuts.....	39
Swinging cuts	40
Wedges	41
Step cuts and angle cuts	43
Planning your cuts	44
Limbing.....	45
Scrub clearing	47
Ripping	47
7. Pruning with a pole saw	49
Choosing the right pole saw	50
Cutting techniques from the ground	51
Cutting techniques from an EWP.....	54
Pruning to AS 4373	56
Working near overhead powerlines	60
Summary of pole saw pruning techniques	62
8. Tree defects and growth characteristics	63
Dead, dying and over-mature trees	64
Burnt trees.....	66
Fungal decay.....	68
Insect attack	69
Poor branch attachment	70
Poor architecture	72
More examples of stem defects	73
9. Becoming a good operator.....	76
10. Competency assessments	78

1. Introduction

There are two booklets in the *Chainsaw Operation* series:

- ***Maintenance, Crosscutting and Pruning***
- ***Beginner to Advanced*** (including all of the above topics, plus tree falling at basic, intermediate and advanced levels).

These booklets are not designed to take the place of face-to-face instruction with a qualified trainer. But they will help you to learn the fundamental information that every chainsaw operator needs to know in order to work efficiently and safely.

Their purpose is to prepare you for the practical training sessions, so that you'll have an understanding of why you're being taught to do things in a certain way and why you need to wear and carry particular items of safety equipment.



This booklet – *Maintenance, Crosscutting and Pruning* – covers the basic skills and knowledge required to crosscut timber products and felled trees, and carry out operator maintenance on the chainsaw. It also covers the principles of pole saw operation and aerial branch pruning.

It is aligned to the following units of competency:

AHCMOM213: Operate and maintain chainsaws.

FWPCOT2259: Cut materials with a hand-held chainsaw

FWPCOT2254: Maintain chainsaws

FWPCOT2273: Trim and cut felled trees

FWPCOT3301: Trim trees using a pole saw

2. Safety and environmental care

A chainsaw is one of the most efficient cutting machines you're ever likely to use. But it's also one of the most dangerous.

In this chapter, we'll look at the safety features on a chainsaw, personal protective equipment, environmental care procedures, and some basic safety principles that are designed to protect you and your work mates from injury or mishaps.

Safety features on a chainsaw

Modern saws have the following safety features:

1. Front hand guard and chainbrake

This protects your left hand and stops the chain if the saw suddenly kicks back while it's running.

When **kickback** occurs, the guard is designed to push into your left hand, forcing it forward and activating the chainbrake.



2. Inertia brake

The inertia brake is built into the internal chainbrake mechanism.

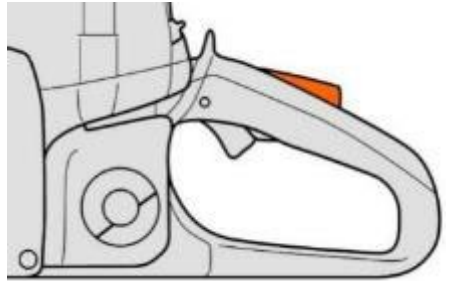
It is activated when it senses that the saw is flicking back suddenly.



3. Throttle lockout

This is a control on top of the handle which must be depressed when you squeeze the throttle trigger.

It's sometimes called a **double-action throttle**, and is designed to stop the saw from revving up if you accidentally bump the trigger.



4. Vibration dampeners

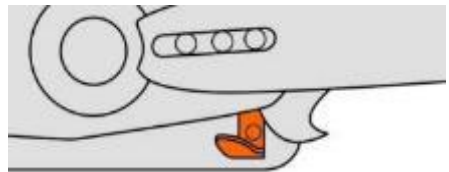
Dampeners reduce the amount of vibration transmitted from the motor to the handles.

They help to cut down on fatigue in your arms and hands, and minimise the chance of nerve damage developing from using the saw over a long period of time.



5. Chain catcher

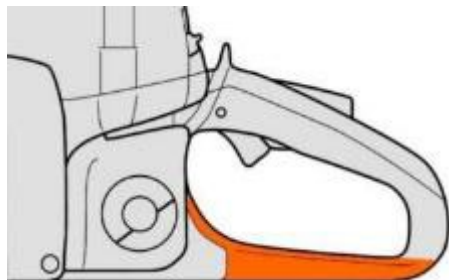
The chain catcher is designed to stop the chain if it breaks or comes off the bar while the saw is running.



6. Rear hand guard

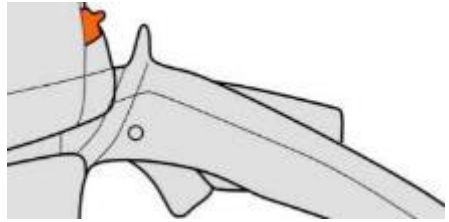
The rear hand guard protects your right hand if the chain breaks or derails from the guide bar.

Remember – there is no such thing as a left-handed chainsaw, so your right hand should always be at the back.



7. Ignition/stop switch

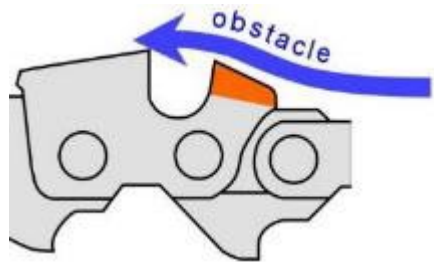
This shuts off the engine and stops the saw. Whatever the model of saw you're using, it will always be within easy reach of your right thumb.



8. Reduced-kickback chain

A reduced kickback chain has little ramps that help to guide obstacles over the front of the cutters.

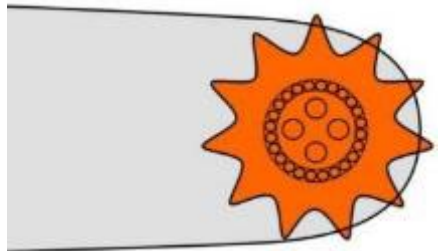
This lessens the chance of kickback occurring.



9. Sprocket nose and narrow nose profile on the guide bar

A sprocket nose on the guide bar allows the chain to run more tightly and with less friction than a nose without a sprocket would.

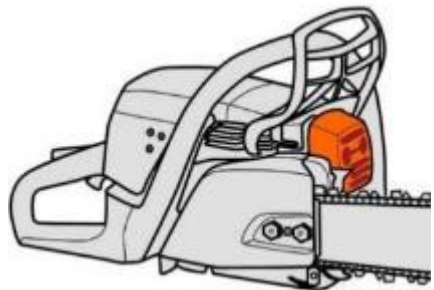
A narrow nose profile also improves safety, because it reduces the size of the kickback zone.



10. Muffler and spark arrester

The muffler reduces the noise level and helps to direct exhaust gases away from the operator.

The spark arrester is a small metal screen in the muffler that catches sparks to stop them from causing a fire.



Personal Protective Equipment

The personal protective equipment (PPE) you wear will depend on the type of work you're doing, and whether you're in the forest or at an established yard or factory. Below are the main items. Note that there are Australian Standards that govern some of these items.

- 1. Safety helmet or hard hat** – protects your head from falling objects.
- 2. Face shield or visor** – protects your eyes from flying particles. Some operators also wear wrap-around glasses for extra protection.
- 3. Ear muffs or ear plugs** – protects your hearing from the loud noise of chainsaws and nearby equipment.
- 4. High visibility vest or jacket** – helps to make you more visible to other workers in the area.
- 5. Gloves** – keeps your hands warm in cold weather. Also specified in some workplaces as a mandatory protective requirement.
- 6. Protective trousers or chaps** – contain cut-resistant material, which is designed to stall the saw if the spinning chain comes into contact with it.
- 7. Steel capped safety boots** – protect your feet from falling objects. In forest conditions, many employers require high lace-up safety boots with ankle support.



Other items of equipment

There are various other items of equipment that you may need to carry, depending on where you're working and what sort of work you're doing.

In the forest, you'll need:

- **hand tools** – such as files, spanner, depth gauge, etc
- **axe** – for removing bark, hammering in a stump vice or wedges, 'sounding' a tree
- **fuel and oil** – sufficient quantity to cover the day's work
- **wedges** – for stopping a cut from closing up on the saw
- **first aid kit** – stocked with suitable supplies.

If you're working with large logs or fallen trees, you may also need a:

- **cant hook** – to move or roll the logs.

In remote areas, forest owners generally require all personnel to carry a **UHF radio**, to stay in contact with other people in the area while they're working. But generally speaking, the best advice for working in a remote area is:

- **don't work alone**
- **have a vehicle on hand**, so you can get out of the forest in an emergency
- **have a system in place** for regular checks to be made on you, either by radio or in person.



Legislation and regulations

In general, the policies and procedures you are asked to follow at work will make provision for the laws and regulations that apply to your job.

But it's worth keeping in mind that some laws go beyond the obligations placed on the company, and extend directly to everyone working on-site. This means that if you do the wrong thing, it's not just the company that will be in trouble – you might end up being prosecuted personally.

Safety laws

Depending on the state or territory you are in, your rights and responsibilities for safety will be determined by the **Work Health and Safety (WHS) Act** or the **Occupational Health and Safety (OHS) Act**.

The Act gives you the right to raise any safety problems with your boss or supervisor and have them taken seriously.

For example, if you think that something you've been asked to do is unsafe, you have every right to go to your boss and sort out the problem before anyone gets hurt.

The Act also imposes certain responsibilities on you, such as the responsibility to abide by the company's safety policies and procedures and to report any hazards that you notice.

You also have a '**duty of care**' towards others in the workplace, which means that you must take reasonable care of the health and safety of anyone who might be affected by your actions.



Environmental laws

Each state and territory has its own environmental legislation. These laws and regulations are policed by the **Environment Protection Authority (EPA)**, or its equivalent body.

All businesses have a legal obligation to look after the environment when they carry out their work. Under the law this is called showing '**due diligence**'. Due diligence in environmental care means that you need to:

- **prevent pollution from occurring** by taking all reasonable steps necessary – such as by disposing of fuel, oil and cleaning fluids properly
- **prevent environmental damage** by minimising your impact on the surrounding area – such as by following harvesting plans carefully and minimising erosion and other damage caused by vehicles or heavy machinery
- **prevent incidents from developing** by doing everything that could be reasonably expected of you under the circumstances – such as by cleaning up spills quickly, before they have a chance to run into the local waterway
- **implement control measures** to minimise risks, and regularly check that they are in place and doing what they are supposed to do – such as by making sure that fuel and other hazardous liquids are stored properly in a secure area.



The law states that if pollution occurs when you're doing something and it threatens or harms the environment, you must tell the EPA or the local council as soon as you can.

Environmental care procedures

Chainsaw operation in the field will always cause a certain amount of disturbance to the environment.

However, there are steps you can take to minimise damage to native **flora** (plants), **fauna** (animals), particularly when you're working in or near environmentally sensitive areas.

Below are some examples of procedures that will reduce the negative impact your activities will have on the local environment.

Native flora and fauna

1. **Leave dead and dying trees undisturbed** unless they are presenting an unacceptable risk to safety or nearby assets.

Tree hollows and crevices provide habitat for many species of native animals, some of which may be threatened or endangered.



2. **Inspect trees and fallen branches for wildlife** before felling them or cutting them up. Try to minimise damage to the surrounding vegetation where possible, and avoid clearing groundcover unless absolutely necessary for safety reasons.
3. **Leave lopped timber on the ground** when you're working in bushland (if permitted by the property owner or manager) to provide shelter and feeding grounds for wildlife.

Weeds

Weeds are not ‘bad’ plants – they’re just plants that are growing in the wrong place.

When they become established in areas they don’t belong in, they out-compete the native plants and reduce the **biodiversity** of the area.

Weeds can easily be spread by workers and their equipment when the seeds and vegetation from a ‘**dirty** area’ are picked up and carried to a ‘**clean** area’.



Here are some tips on ways to reduce the spread of weeds:

1. **Avoid driving through infested areas that are seeding when it’s raining** – this also applies after a heavy dew, or immediately following rain.
2. **Work from a clean area towards a dirty (infested) area** so that you don’t carry contaminated soil or plant material back into the clean area.
3. **Clean down your vehicle and equipment** before leaving a weed infested area – especially if you’re working near high-value crops, organic farms or other environmentally sensitive areas. Pay particular attention to your vehicle’s tyres and undercarriage, and also your boots.
4. **Observe quarantine notices** or directions when entering properties that have quarantine restrictions.
5. **Report any sightings** of ‘prohibited’ or ‘restricted’ invasive plants to your supervisor (or the local authorities) if you think they haven’t been noticed yet, or are listed on your work documents as requiring special attention.

Hazardous liquids

Fuel, oil and cleaning fluids can be very damaging to the environment if they're allowed to escape.

Here are some guidelines on how to store, use and handle these hazardous liquids.

1. **Store all fluids in approved containers**, with the lids firmly sealed when you're not using them.
2. **Use a container with a good spout**, or use a funnel so you don't spill any liquid while you're pouring.
3. **Dispose of hazardous liquids properly**. Don't tip them on the ground or pour them down the sink or into a stormwater drain.

This is how creeks and rivers get contaminated, and it can have a devastating effect on the local plant and animal life.

Instead, put the liquids into containers and have them taken to a waste disposal depot.

4. **Avoid skin contact**. Fuel, oil and cleaning liquids can cause **dermatitis** and other conditions, including skin cancer, so be careful to wash them off straight away if you get them on your skin.

If you find yourself coming into regular contact with these substances, make sure you wear gloves while you're using them.



Fire prevention

Fire is a chemical reaction that needs three ingredients to take place: **fuel**, **oxygen** and **heat**. This is called the **fire triangle**, because if you remove any one of these ingredients, the fire will go out.

In other words, you can extinguish a fire by either **smothering it** (removing the oxygen), **cooling it** (removing the heat) or **removing the fuel source**.



At the depot

When you're working at the depot or in a factory, it is possible to minimise the chance of a fire starting by following two simple rules:

1. **Good housekeeping.** Keep the workplace tidy by sweeping up sawdust, putting timber offcuts in the bin and generally removing debris from the work area before it has a chance to accumulate.
2. **Keep ignition sources away from flammable and combustible materials.** Ignition sources include naked flames and sparks (such as from welders or grinders). Note that sparks can also come from chainsaw mufflers that have missing spark arrestors.

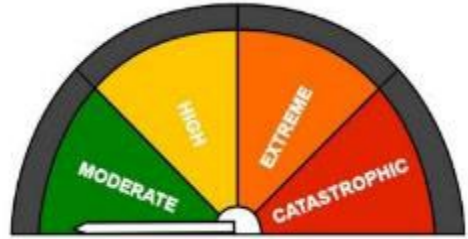
In bushland

When you're working in bushland, it's much harder to have any influence over the three elements of the fire triangle. You are surrounded by **fuel** in the form of wood and plant material, and the availability of **air** and **heat** are directly controlled by the weather conditions.

This means that you need to put a plan in place to deal with the possibility of a bushfire. Depending on the level of risk and the locality you're working in, your plan might include: carrying fire fighting gear in your vehicle, having an emergency evacuation procedure, monitoring the weather conditions, and leaving the area if conditions deteriorate.

Fire danger ratings

The **Fire Danger Rating** (FDR) is a prediction made by the fire authorities of the bushfire hazard on a particular day.

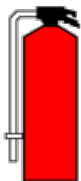


It is issued during the fire danger period, and is based on a calculation called the **Fire Danger Index**, which estimates how difficult a fire will be to control given certain weather and fuel conditions. The higher the FDR, the more precautions you should take when you're operating a chainsaw – especially if you're working in bushland.

Fire agencies also issue **Total Fire Ban** orders on very risky days, which prohibits particular types of activities that could start a fire. In general, chainsaw operation is allowed, but there are strict conditions imposed on its use. Be sure to check your local agency's website for the compliance requirements before operating a chainsaw on a total fire ban day.

Fire extinguishers

Different extinguishers are used to put out different types of fires. The two most common types used by chainsaw operators are shown below. In a factory or warehouse, the first one – containing water – is often replaced with a **fire hose** that supplies water from a hydrant.



Colour: **solid red**

Contents: **water**

Types of fire: **paper, wood, plastic** (Class A)

Not for use on cooking oils, fats or electrical fires



Colour: **red with white band**

Contents: **dry chemical or powder**

Types of fire: **most fires** (Classes A, B, C, E)

Not for use on cooking oils or fats

Risk assessment

A good way of ensuring that you've taken everything into account before you start a job is to carry out a **risk assessment** of the area you'll be working in.

The purpose of a risk assessment is to:

- **identify** any hazards in the area
- **assess** the risk of each hazard causing an accident, injury or environmental damage
- **control** the risk, either by removing the hazard or minimising its effect.



Below is a simple example of a risk assessment checklist you might follow before starting your day's work in the forest.

1. **Overhead hazards** – are there any overhead hazards, such as dead branches, widow makers or dead-topped trees?
2. **Manual handling hazards** – are there heavy objects that need to be moved or carried, awkward locations or difficult positions?
3. **Slips, trips and falls** – are there any holes, wet ground, covered or hidden obstacles, unstable rocks, steep slopes or drop-offs?
4. **Cut and lacerations** – are there any sharp branches at eye level, rock protrusions or other hazards that might cause cuts or lacerations?
5. **Other workers in the area** – are there other workers or machines operating nearby that might come close enough to cause a hazard?
6. **Weather conditions and fire risk** – are the current or predicted weather conditions likely to pose a risk while working (e.g. winds, storms, excessive temperatures, extreme fire danger)?
7. **Surrounding environment** – are you working in or near areas that need extra protection from environmental damage (e.g. creeks, streams, high-value crops, habitat for native animals)?

6. Trimming & cutting felled trees

In this chapter, we'll look at the techniques used to trim and cut felled trees and deal with the typical hazards you're likely to find when you're working in a forest or bushland environment.

The 3 basic cuts

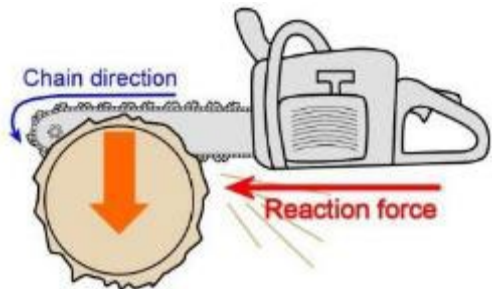
Although there are lots of advanced cuts used by professional chainsaw operators, every cutting technique is based on one or more of the following three basic cuts:



Downcut

The downcut uses the **underside of the bar**.

Because the chain is coming back towards the saw on the underside, the reaction force it produces tends to pull the saw **into the cut**, away from your body.



Upcut

The upcut uses the **top of the bar**.

This time the cutting part of the chain is moving in towards the log, so the reaction force tends to push the saw back **out of the cut**, towards your body.



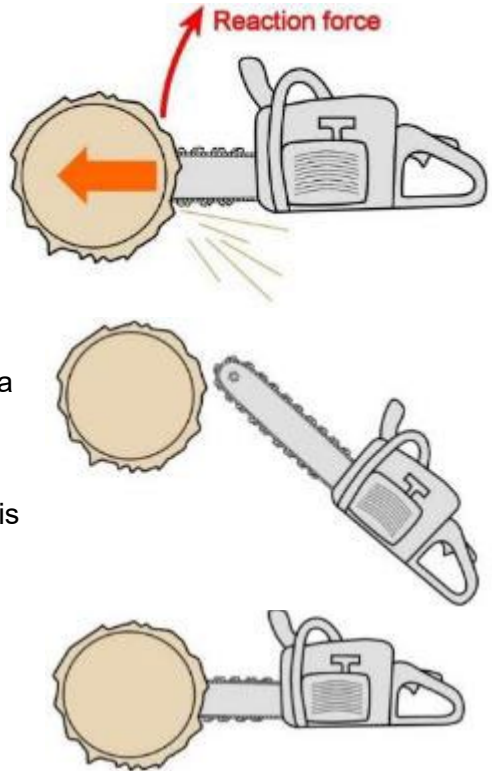
Bore cut

The bore cut uses the **nose of the bar** to do the cutting.

The reaction force that you need to be most careful of when you start the borecut is **kickback**, because that's what will happen if you let the kickback zone on the nose come into contact first.

The safest way to do a bore cut in a log is to:

1. **Angle in at 45°**, using the bottom of the nose until the bar is in to the full depth of the nose.
2. **Straighten up** and push in to bore through the wood. It's best to use your legs for extra power as you push the saw in.



If you are cutting logs that are near ground level, you can angle in to do a bore cut by using the **top of the bar**.

But you must be careful to avoid using the **kickback zone** of the bar to do any cutting while you are still angling in.

Make sure that the **nose is buried** well into the timber before you straighten up the saw.

Then **use your legs** for extra power as you push in.



When you're doing a bore cut, be extremely careful at all times not to let the **reaction force** push the bar out of the cut and cause kickback. It's also all the more important to consciously double check that you're following all the rules of good cutting practice, including:

- maintaining a firm stance
- keeping the chain sharp
- keeping the chain correctly tensioned
- cutting at peak revs throughout the cut.

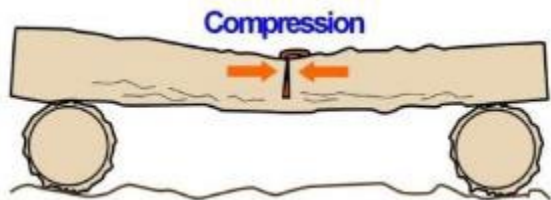
The 2 main stresses

There are two main stresses in logs and felled trees.

Compression

Compression occurs when the wood fibres are being pushed **towards** each other.

When you cut wood under compression, you need to be careful that the sides don't close up and **bind** the saw in the cut.



Tension

Tension occurs when the fibres are being **stretched**.

When you cut wood in tension, the two halves start to pull away from each other.



Bridging cuts

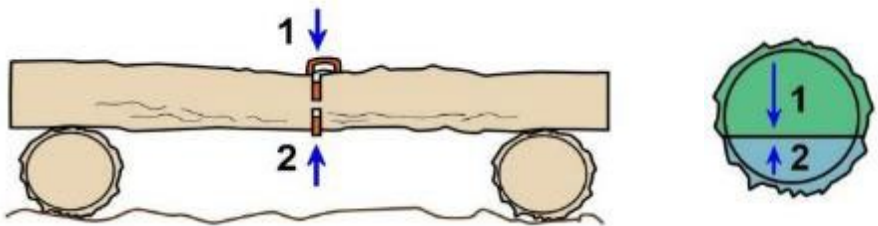
The log at right is in **compression** on top, because it's supported at each end and forms a bridge between the two supports.



This is called a **top bind**.

The best way to do a **bridging cut** on a log with top bind is as follows:

1. **Cut down as far as you can** before it begins to pinch the bar.
2. **Cut from the bottom up** until the two cuts meet.

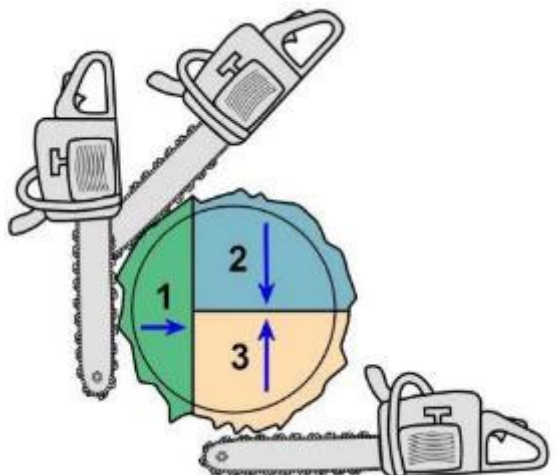


For logs that are thicker than the length of the bar:

1. **Put a cut on the opposite side of the log.**
2. **Pull the saw towards you** and cut down until the top gap starts to close.

Then release the trigger and withdraw the saw from the cut.

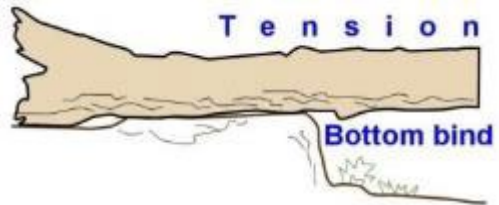
3. **Cut from the bottom up** to finish the 'release cut'.



If it is too difficult to reach over the log for the first cut (shown in the diagram above as 1), you can stand on that side of the log and cut all the way down. The walk around to the other side and put in cuts 2 and 3.

Swinging cuts

This log has the opposite problem from the log on the previous page. It is hanging over the edge of its support, so now the bottom is under compression and the top is in tension.



The log, therefore, has a **bottom bind**.

But unless it has a small diameter, say up to the thickness of your thigh, you can't simply cut straight down, or you'll risk tearing the grain on the bottom as it starts to give way.

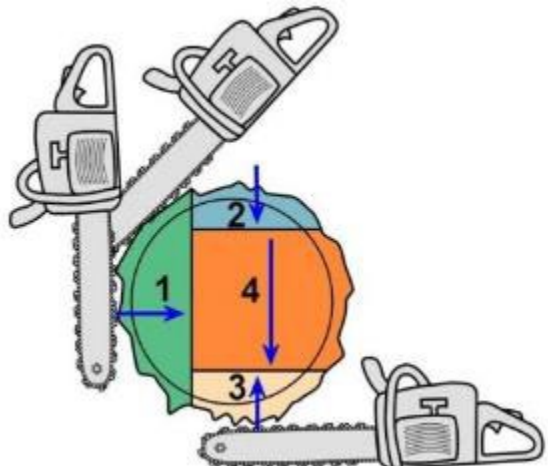
In this case, you need to do a **swinging cut**:

1. **Cut upwards** until you break the bind.
2. **Cut down from the top** to finish the cut.



For logs thicker than the length of the bar:

1. **Put a cut on the opposite side of the log.**
2. **Pull the saw towards you**, cutting down slightly as you go.
3. **Cut from the bottom up** until you break the bind.
4. **Cut down** the rest of the way to finish the cut.



If you find yourself with a very large log, and you're unable to reach over to do the first cut, the easiest solution is to:

1. **Cut all the way down one side** of the log first.
2. **Walk around to the other side** to complete the sequence of cuts.

Of course, you still need to use the right system for a top bind or bottom bind to avoid jamming the saw.



Wedges

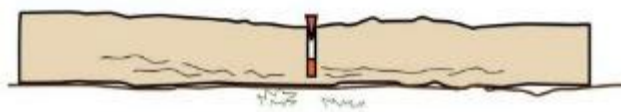
If you find that the cut is closing up on the bar and jamming it, the safest way to get out of trouble is to use a **wedge**.

1. **Put the chainbrake on** to make the saw safe.
2. **Tap the wedge into the cut**, using the back of an axe or a lump hammer.
3. **Pull the saw out** once it's free.



Using a wedge with a bridging cut

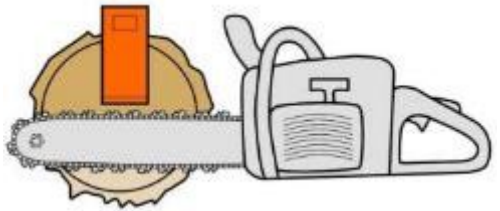
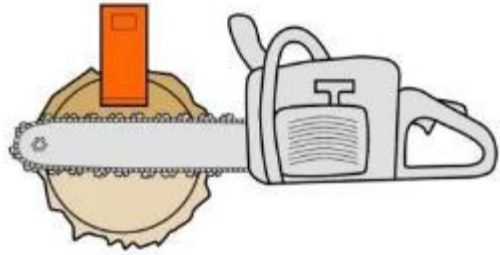
You can also use a wedge while you're carrying out a bridging cut to keep the width of the cut (or '**kerf**') open.



This is especially useful with heavy logs when they're lying flat on the ground.

In these cases:

1. **Cut down far enough** so you can tap a wedge in above the guide bar without it hitting the cutters.
2. **Insert the wedge.**
3. **Keep cutting and tapping the wedge** in progressively to stop the kerf from closing up on the saw.



Types of wedges used in cross cutting

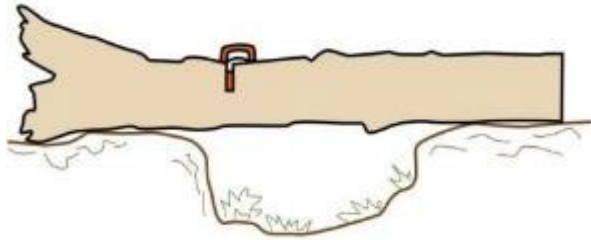
Wedges are made of different materials. Some are more suitable than others for particular purposes.

- **Plastic wedges** are commonly used in cross cutting, because they don't damage the chain if the cutters accidentally come into contact with the wedge.
- **Aluminium wedges** are also suitable, particularly if you also carry out tree falling, but they are not quite as gentle on a chain as plastic.
- **Steel wedges** will definitely damage the chain if there is any contact with the cutters. These wedges are generally reserved for tree falling.



Step cuts and angle cuts

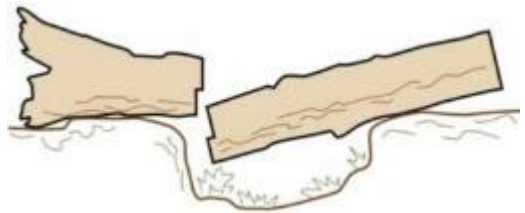
Now that we've covered the principles of bridging cuts and swinging cuts, let's go back to the scenario of a log suspended over two points.



In the above instance, the situation is slightly different from the top bind we looked at earlier. This time, the left hand side of the log can't move when it's cut through, because there is too much weight on the other side of the embankment. So now only the right hand side is able to fall.

One of the problems with this scenario is that the log could jam in place and pinch the saw without falling through.

The best way to overcome the problem is to use a **step cut** when you do the upcut (as shown at right).



A variation of the step cut is an **angle cut** (shown underneath at right).

Note that in both of these cuts, the inside of the step or angle should be on the side that doesn't fall, because there will be less chance of the log jamming.



There are also times when you can use a step cut to help hold the saw up, so it doesn't fall through with the falling log. In these cases, the step is placed on the **opposite side** from the examples above, so that when the free side falls the guide bar is still supported by the step.

Always remember to cut through the **compression wood** first, and closely monitor any movement in the log or branch as you get close to the point where the kerf is about to start closing. Then cut the **tension wood**.

Also make sure that you finish the job with a final flush cut if the end of the log has torn grain or other protrusions.

This will help to keep the area safe for other people to walk through later on.



Planning your cuts

Before you commence any cutting, you should always think ahead and ask yourself:

... when I release the stresses in this log, what's it going to do?

... and where should I be when that happens?

Generally speaking, you will be able to predict the direction a log or branch will go as long as you take into account all of the forces acting on it.



But you still need to be alert for any movements that you hadn't allowed for, and take corrective action before you finish the release cut. It may also mean you have to change the sequence of cuts you'd originally planned.

The general principles on planning ahead and deciding where to stand are:

- **stand to one side** of the cut (and the saw) to avoid the hazard of kickback
- **stand on the opposite side** of the log from any springing or whipping action that might result when you release the stresses
- **stand on the uphill side** of the log when you do the release cut that will allow the log to roll
- **don't cut** a log or limb if you can't work out where the stresses are and what the reaction forces will be.

This last point particularly applies to **windblown** or **uprooted trees**. If the root system is still partly submerged in the ground, there is the risk that the stump could spring up suddenly when the trunk is cut through.

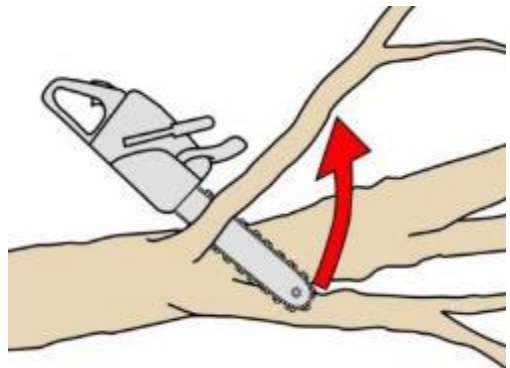
In some cases you may need to get a machine to clear the windblown tree, or ask an expert chainsaw operator for help before you start.

Limbing

Limbing is the process of removing branches from a tree.

One of the biggest risks here is **kickback**, because there will often be times when the nose comes close to other branches that you're not watching.

Remember to stay aware of where the nose is, especially when you can't actually see it.



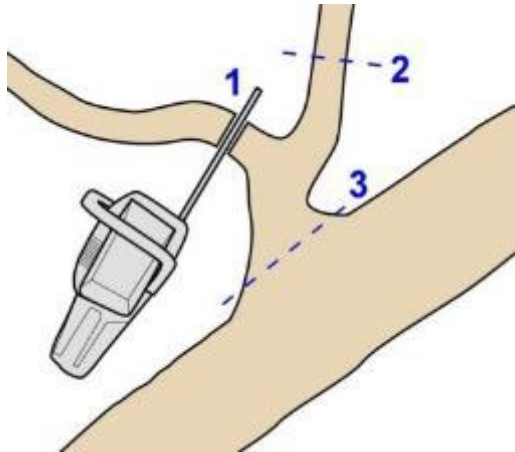
Another potential hazard is the release of pent-up **stresses** in the branches when they're cut through. This is a particular problem in branches that are trapped under the weight of a log or entangled with other branches.

Here are some hints on safe limbing practices:

1. Before you cut, think about the stress forces stored up in the limbs, so you can plan your cuts to release the tensions in a controlled way, without the branches whipping back suddenly.

2. Remove small branches first and clear them the out of the way.

3. Remove difficult branches piece by piece, cutting in sequence from the outside towards the main trunk.

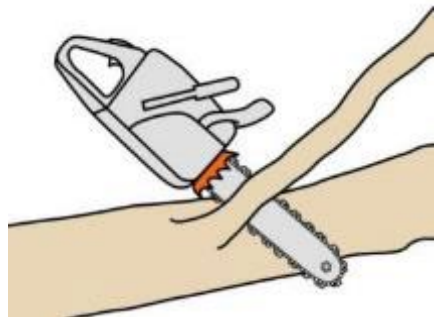


4. Never work above shoulder height, because that's when you have the least amount of control over the saw's movement.

5. Use step cuts or other techniques used in cross-cutting logs if you're cutting large limbs, so that you don't jam the saw.

6. Let the tree support the weight of the saw whenever you can.

The best way to do this is to stand on the opposite side of the trunk, and use the **spikes** (or '**dogs**') as pivot points as you cut up or down to trim the branches.



7. Don't leave protruding branch stubs on trimmed logs. Cut them flush.

Adjusting your grip

When you're limbing, you will need to re-adjust your grip on the saw to change its position for different cuts.

To hold the saw **horizontally**, shift your left hand around to the side of the front handle and change your rear handle grip accordingly.

Make sure you maintain the same upright balance and avoid awkward twisting of your shoulders or back.



Scrub clearing

You can clear scrub with a chainsaw by holding it horizontally and sweeping it backwards and forwards across the vegetation near ground level. The same cautions apply as for limbing – maintain a well-balanced stance, beware of kickback and always stay mindful of the pent-up stresses in the branches and stems.

You should also avoid leaving stems with points or sharp angles. These can cause injuries to people and also damage vehicle tyres.

Ripping

Ripping is the term used for cutting in the direction of the grain.

You can use the chainsaw to cut fence posts and other heavy section material by ripping the log lengthwise.

However, the saw needs to be high powered to cope with the extra stresses placed on it.



Note that a normal chain – sometimes called a **full complement chain** – will make your chainsaw work much harder than the **ripping chains** that are used in portable sawmills, such as a Lucas Mill.

This is because ripping chains have different cutter configurations and filing angles.

For example, a **skip tooth chain** has an extra drive link between the cutters, which helps to reduce the build-up of chips. It also requires less power to operate.



Nonetheless, you can still rip timber with a hand-held chainsaw and normal crosscutting chain using the following technique:

1. **Secure the log** so it can't roll sideways. Use branches or offcuts to chock up the sides.
2. **Stand to one side** of the log throughout the cut – don't straddle it.
3. **Maintain peak revs** while you're cutting.
4. **Use the spikes** for leverage on the top of the log, and swing the guide bar into the cut, working along the length of the log.
5. **Keep the chain off the ground** at all times. If possible, try to raise the log up onto packing pieces before you start. If it's not possible, rip halfway through the log on one side, and then roll it over and rip through the remaining timber on the other side.

7. Pruning with a pole saw

Motorised pole saws operate in much the same way as chainsaws. The obvious difference between them is the distance between the powerhead and the cutting attachment.

They are often called **pole pruners** because their main function is pruning tree limbs from the ground.

High-reach pole saws with telescopic shafts can have a length of up to 4 metres. This allows the operator to reach branches well above ground level without needing to climb the tree or bring in an EWP (elevating work platform).

However, the extra height capability introduces new hazards for the operator, over and above the usual considerations that apply to chainsaws.

These include:

- **falling branches** that may injure the operator or other people standing in or around the drop zone
- **hung up (suspended) branches** that get caught in the crown and don't fall cleanly to the ground
- **overhead powerlines** in close proximity to the work area
- **muscle strain**, particularly in the neck and shoulders, from looking up and controlling the cutting head on the end of the long pole.



Choosing the right pole saw

Pole saws are available in a range of sizes and power sources.

It's worth mentioning here that the term **pole saw** can also refer to a manually-operated saw blade mounted on a long pole – although we will restrict our discussion in this booklet to powered saws.

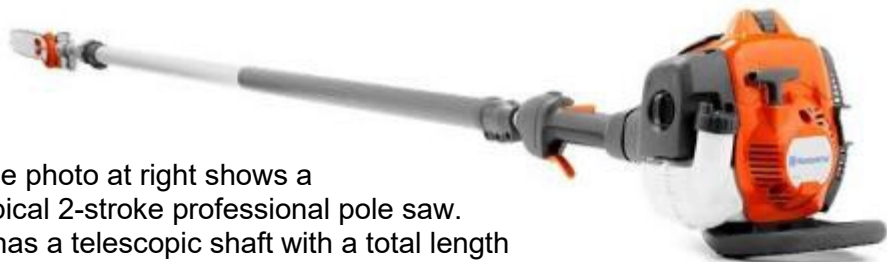
The most common **guide bar length** on professional pole saws is 250 mm (10 inches). However, some saws are fitted with slightly shorter bars, and some are capable of taking longer bars, typically up to 300 mm (12 inches).



Power sources include:

- **2-stroke engine** – most common for professional operators, because it offers the best performance and power-to-weight ratio
- **4-stroke engine** – less noisy than an equivalent 2-stroke engine, but not as powerful for its size
- **battery ('cordless')** – less powerful and shorter in shaft length than petrol-engine machines, but requires less maintenance
- **mains power ('corded')** – plugs into a standard 240-volt power point, but only designed for domestic use
- **hydraulic ('hydrosaw')** – professional saw powered by a hydraulic hose that attaches to a machine such as an EWP.

The photo at right shows a typical 2-stroke professional pole saw. It has a telescopic shaft with a total length of 4.02 metres, and weighs 7 kgs (not including the cutting head).



Model: Husqvarna 525PT5S

The **weight and length** of the pole saw are factors to consider when deciding on which model will be most appropriate for a certain type of work. Bigger saws will give you a better reach and the capacity to cut larger branches, however, they can become tiring to hold over a period of time.

It's also more difficult to control the cutting head when the shaft is long and at full extension, particularly when you're trying to work around other branches in the canopy.

The best way to reduce muscle strain and improve control of the cutting head is to wear a **harness**. There are different types of harnesses available, ranging from a simple shoulder strap through to an upper-torso harness with shoulder straps and a waist belt that helps to transfer the weight of the machine down to your hips.

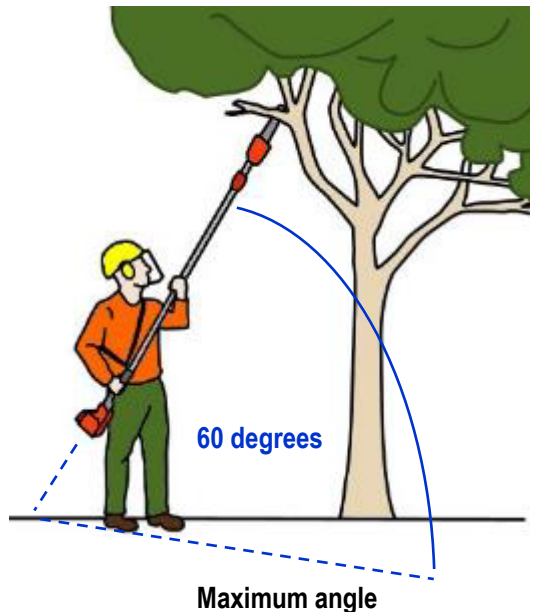
Cutting techniques from the ground

In terms of muscle fatigue, the easiest angle to work at when you're using a pole saw from the ground is **60°**.

This is also the **maximum angle** you should hold the saw at, so that you're not standing inside the drop zone while you're working.

The **drop zone** is the area where the limbs and debris are falling.

Note that even at 60° you'll still need to position yourself well away from large branches as they fall.



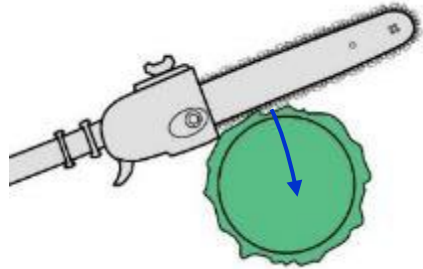
Remember that branches can sometimes swing in unexpected directions or get caught in nearby branches as they fall.

They can also break up when they hit the ground, especially if they're dead and brittle.

Never stand underneath a limb being cut, or allow anyone else to stand inside the drop zone – including fellow workers who are removing fallen debris for you or carrying out the duties of a safety observer.

Smaller-diameter branches

To crosscut smaller-diameter branches, place the cutting head above the branch, with the housing resting on the branch, and then cut downwards.



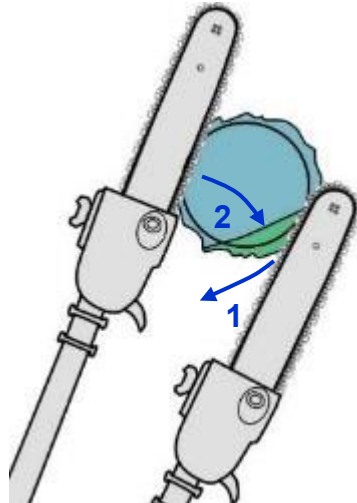
This will help you to control the saw and avoid pinching the bar.

Larger diameter branches

To crosscut larger diameter branches, put a **relief cut** on the underside of the branch first. Then do a **top cut** by positioning the housing above the relief cut and cutting downwards.

This will stop the bark and wood fibres from tearing away on the underside of the branch as it starts to fall.

The easiest way to do a relief cut when working from the ground is to pull the saw back towards you in an arc across the underside of the branch.



Make sure you keep good control of the cutting head to avoid the problem of **kickback** as you finish the undercut. If you need to revise the cutting techniques that involve using the nose of the guide bar, go back to the earlier chapters in this booklet that cover 'kickback' and 'bore cuts'.

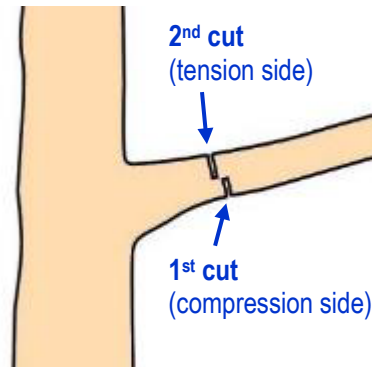
Step cuts

In the previous chapter (*Trimming and cutting felled trees*) we also talked about using **step cuts** as a way of controlling the saw and stopping it from falling through the cut as the branch is released.

This principle is very useful for pole saw operators, especially when the shaft is fully extended.

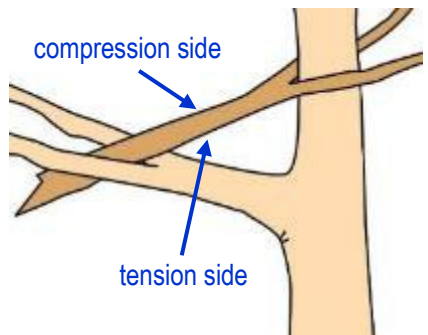
The procedure for doing a step cut is as follows:

1. **Put the first cut on the compression side** of the branch (in this example, the underside).
2. **Put the release cut on the tension side**, with the step on the inside (towards the trunk).



Remember that the tension and compression forces in a **hanger** supported at both ends (as in the example at right) will be the opposite to the forces acting on a normal branch.

This means that the 1st cut and 2nd cut placements will be reversed, so the **release cut** will now be on the underside.



The same situation could also apply to attached branches that are held up for some reason at the other end – such as branches resting heavily on a fence or other supporting structure.

Always be very wary of branches that are under unusual stresses, because they could whip back unexpectedly when the tension is released.

Cutting techniques from an EWP

There are various cutting techniques used in aerial tree trimming that go beyond the simple cuts already discussed.

These more advanced techniques are often used by arborists and powerline tree trimmers in conjunction with **rigging ropes** to lift or lower the limbs as they're being dismantled.

It is beyond the scope of this booklet to discuss the types of rigging setups used in aerial tree trimming.

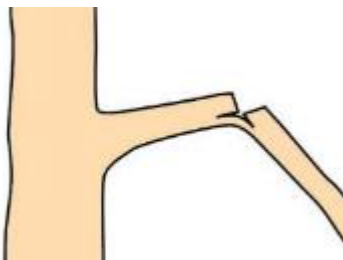
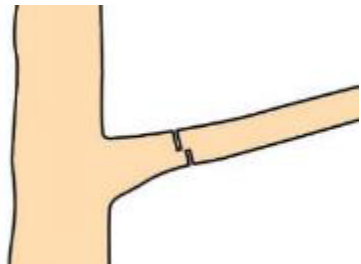
However, if you're involved in this sort of work, you will receive separate training in these specialist skills.



Types of cuts

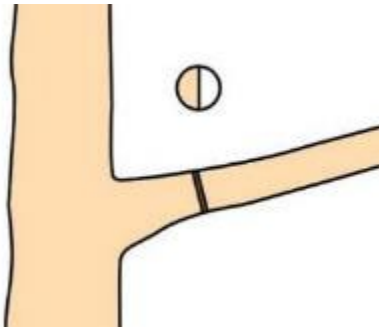
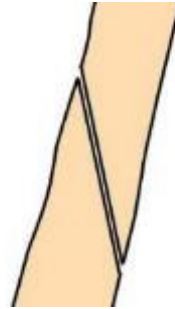
Below are the main types of cuts used by pole saw (or hydrosaw) operators working from an EWP.

Snap cut – basically the same as the step cut (described previously); but in this case you should leave enough wood in place to hold the branch until it's snapped free by the rigging rope.



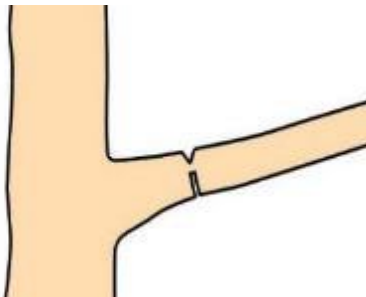
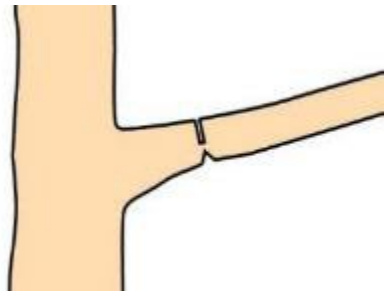
Fold cut – allows the branch to swing down, away from powerlines or obstacles, using the attached fibres as a hinge. However, it must be kept well clear of the branch collar to avoid damage if the fibres strip back on the underside.

Spear cut – used on small vertical branches to allow them to fall butt first to the ground; good for ‘fast cuts’ on branches that are growing between powerlines or other obstacles.



Single side cut (also showing section through branch) – works like a sideways fold cut, using the attached fibres as a hinge to slew the branch sideways while pulling it with a guide rope.

Scarf undercut (then top cut) – achieved by scarfing the underside of the branch and then doing a release cut on top, which provides a hinge to let the branch swing towards the drop zone.



Top scarf (then bottom back cut) – the opposite of a scarf undercut; in this case allowing you to pull the branch back up into the crown with a lowering rope before doing the release cut.

Pruning to AS 4373

The benchmark standard for pruning trees is *Australian Standard 4373-2007: Pruning of amenity trees*.

There may be times when it isn't possible to fully comply with AS 4373 – particularly if you're working near powerlines and there are network operator procedures that apply.

Nonetheless, you should always try to follow AS 4373 wherever you can, because if pruning isn't done correctly, it can cause long-term damage to the tree or stimulate growth in directions that aren't desired.



Natural target pruning

The principle of **natural target pruning** is to cut branches at points where the living tree's own defence mechanisms allow the wound to heal quickly and keep the tree healthy.

It was once thought that painting the cut with a 'wound paint' would be the best way to seal off the area and prevent decay.

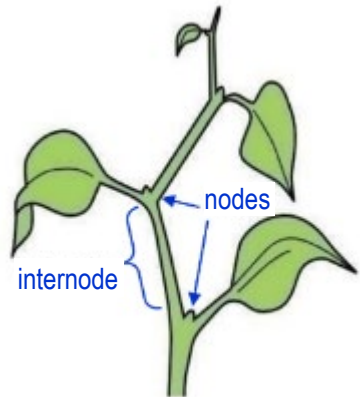
However, research has shown that wound paints are not as effective as the tree's own **defence mechanisms**, as long as the cut is placed correctly.



The general rule of pruning is to always make cuts at tree **nodes**, where the leaves and lateral buds are attached to the stems.

In other words, don't make the cuts along the **internode** – that is, the region between two nodes.

This helps to ensure that the only tissue being removed is from the branch being cut, and the remaining stem tissue is left undamaged.



Characteristics of a good pruning cut

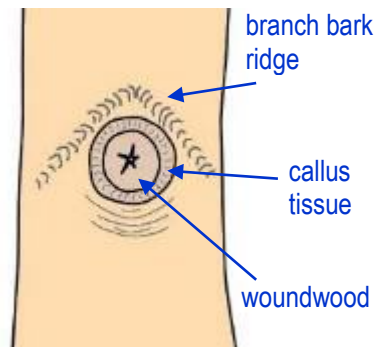
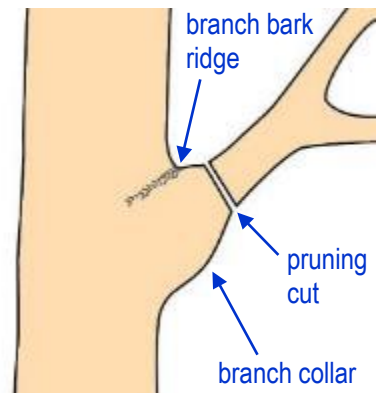
The final pruning cut on a branch should be placed just outside the line of the **branch collar**, where the wood tissue from the trunk and branch overlap.

It is generally visible as a swelling around the base of the branch. The branch collar contains defensive chemicals that allow it to **compartmentalise** the wound and protect the tree from outside organisms.

Above the collar, the union between the branch and trunk is also generally marked by raised or furrowed bark, called the **branch bark ridge**.

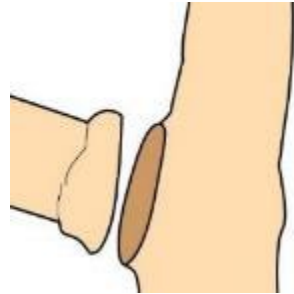
When the pruning cut is made, the tree's first response is to wall off the wound with **callus tissue** around the margin, followed by a very tough layer of **woundwood** to close off the opening.

The sign of a well-sealed pruning cut is a full circle of callus tissue around the woundwood.



To prune dead branches, the procedure is much the same – place the final cut as close to the branch collar as possible, without damaging any living tissue.

Flush cutting a branch right back to the stem reduces the tree's ability to compartmentalise the wound and seal it off from infection and insect attack. It also makes the wound larger than it needs to be.



For these reasons, flush cutting is not an approved cutting technique in AS 4373.

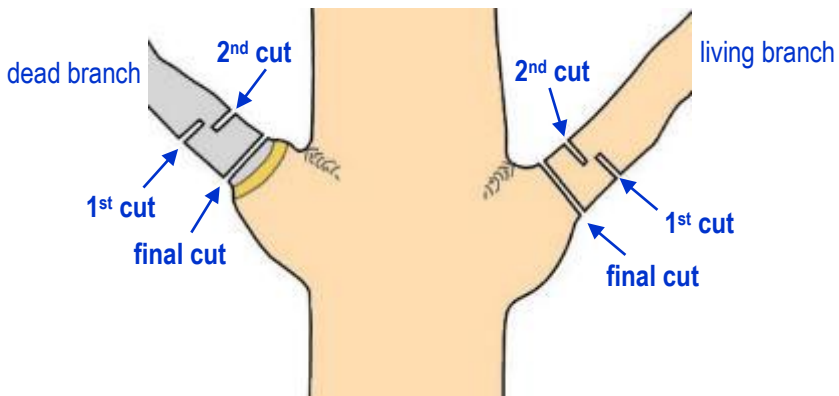
Pre-cuts on larger branches

On larger branches, **precuts** are used to cut the branch back to a stub outside the collar. The final cut can then be made without tearing the remaining wood tissue.

A typical **three cut method** uses the following steps:

- **first cut** on the compression side – generally an undercut
- **second cut** on the tension side to release the branch and let to fall
- **final cut** to trim the stub back to just outside the branch collar.

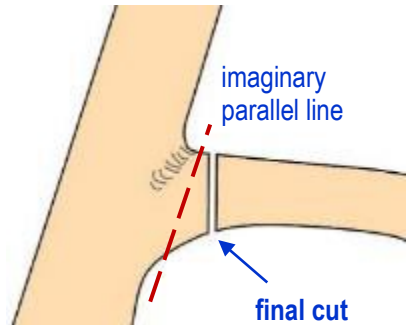
The cutting sequence is shown below, for both living and dead branches. You can see that the stepped precuts leave the step on the inside of the branch (towards the trunk).



No visible branch collar

If there is no visible branch collar, the branch bark ridge can be used as a guide in the following way for the final cut placement:

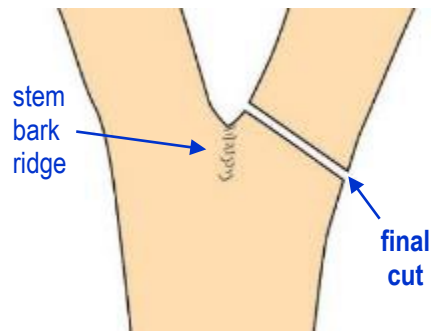
- **mentally draw a line** parallel to the trunk, just outside the branch bark ridge
- **start the final cut** at the same top point as your imaginary line, but cut at an angle that's at a 'mirror image' to the branch bark ridge.



Co-dominant stems

In the case of a tree with co-dominant stems, the union between them is called a **stem bark ridge**.

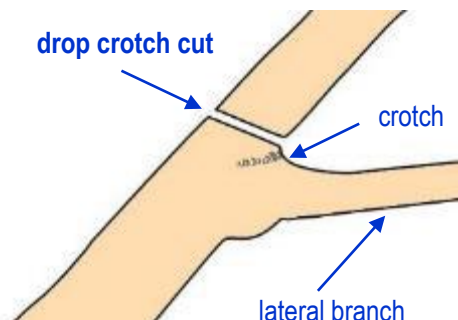
This time, you should place the final cut outside the stem bark ridge, with the bottom of the cut directly opposite the bottom of the ridge.



Drop crotch cutting

The fork between a branch and the main stem, or between two branches, is called a **crotch**.

A **drop crotch cut** is used to reduce the height of a tree by pruning the leaders and branches back to the crotch with lateral branches.



To decide on the placement and angle of the final cut, use the same method as described previously for codominant stems.

Drop crotch cutting is a form of **reduction pruning**, since it is used to 'reduce' the size of the tree. AS 4373 says that whenever you do a reduction cut, you should ensure that the lateral branch you're cutting back to is at least **one third the diameter** of the branch being reduced.

Working near overhead powerlines

Most pole saws are **not electrically insulated**. This means that if they come into contact with a live overhead powerline, they will form a **conductive path** to the ground for the electric current to flow through – via the saw and your body.

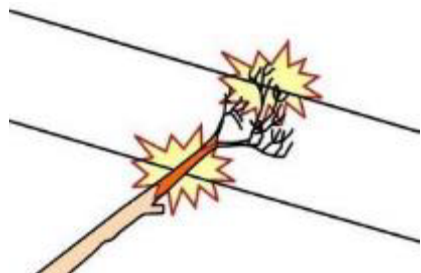
In the case of **high voltage powerlines**, even bringing the saw close to the lines will allow the current to jump (or 'arc') across the gap and flow to the ground.

The same principle applies to trees growing near powerlines. Branches and foliage can form conductive paths, especially when they're wet.

They can also cause **flashovers** if they fall on the lines and bridge across two or more phases to create a short-circuit.

If you or the saw you're holding make direct contact with a live **low voltage** powerline (up to 1000 volts), such as a service line to a building, you will get a very nasty electric shock that could prove fatal.

A **high voltage** (above 1000 volts) shock would give you an even shorter life expectancy.



Electricity network operators specify minimum clearance distances for personnel who are working near live overhead powerlines. These **safe approach distances** differ, depending on the voltage of the powerlines and the level of authority of the personnel.

People who have not been authorised by the network operator to work near their powerlines are called **ordinary persons**. Most network operators use the following minimum safe approach distances for ordinary persons.

Ordinary person minimum safe approach distances	
Up to and including 132,000 volts	3 metres
Between 132,000 and 330,000 volts	6 metres
Above 330,000 volts	8 metres

Note that these distances apply to any part of your body as well as any conductive item you are holding, including a pole saw. It also includes branches that are sappy, wet or conductive for some other reason.

There are also minimum clearance distances for vehicles, cranes and other machinery, which may differ depending on the network operator.

Powerline tree trimmers who are authorised to trim vegetation on the electricity network generally use **insulated hydrosaws** when they're working from an EWP (elevating work platform).

This allows them to work much closer to the powerlines. Nonetheless, they still need to stay outside the safe approach distances specified for their level of authorisation and the voltages concerned.



Summary of pole saw pruning techniques

Below is a brief summary of the approved techniques you should use when pruning trees with a pole saw.

1. **Set up an exclusion zone** around the work area and ensure that all pedestrian and traffic movements are properly controlled.
2. **Clear the work area underfoot**, especially in the places where you and your work crew will be standing and moving around.
3. **Inspect the tree** before starting work – in particular, look for fungal decay that might indicate weakened branches, and dead or broken branches that could shake loose and fall.
4. **Hold the saw at a maximum angle of 60°** (to horizontal) while cutting, and be ready to step back as soon as the branch starts to fall.
5. **Keep the saw running at full revs** throughout the cut, but reduce your pressure on the bar as you get to the end of the cut so that the saw doesn't jump out or suddenly fall through when the branch is released.
6. **Don't stand underneath the branch being cut**, and be wary of other branches overhead that may break away while you're working.
7. **Don't allow anyone else to stand inside the drop zone** while you're cutting, including fellow workers.
8. **Avoid damaging other parts of the tree** – keep the spinning chain away from branches that will be kept, and don't let falling branches damage other areas of the crown or trunk.
9. **Use approved pruning techniques**, to help the tree maximise its own defence mechanisms as it seals off the cuts from infection and insect attack.
10. **Stay well clear of overhead powerlines**, and remember that the pole saw is like an extension to your own body in terms of conducting an electric current.